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TAILINGS AREAS AND EVAPORATION PONDS WORK PLAN

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SECTION 1.0
INTRODUCTION

Atlantic Richfield Company has prepared this Draft Tailings Areas and Evaporation Ponds Work Plan (Work Plan) to conduct field investigations that will support an assessment of potential human health or ecological risk associated with, and planning for the permanent closure of, these mine units pursuant to the Closure Scope of Work (SOW) for the Yerington Mine Site. Because of the close spatial and temporal relationships between the Tailings Areas and the Evaporation Ponds, this Work Plan combines the site investigation activities anticipated in two Work Plans described in the SOW. This Work Plan also proposes site investigation activities for related mine site features including two landfills, septic tanks and municipal sewage treatment lagoons, and associated piping. Results of the proposed site investigation activities described in this Work Plan will be compiled and presented in a Data Summary Report.

The remainder of Section 1.0 of this Work Plan describes the location and hydrologic setting of the Tailings Impoundments, Evaporation Ponds and associated features. Section 1.0 also presents the results of previous sampling and analytical activities, and describes the data quality objectives (DQOs) for this Work Plan. Section 2.0 presents information about the construction and operational history of these features, and a description of their current status.

Section 3.0 presents the details of the site investigation activities including proposed sampling locations, sampling protocols, and quality assurance and quality control (QA/QC) objectives. Section 3.0 of this Work Plan also presents a task-specific Job Safety Analysis in the context of the comprehensive Health and Safety Plan for the Yerington Mine Site. Section 4.0 lists references cited in this Work Plan.

1.1 Location

The Yerington Mine Site is located west and northwest of the town of Yerington in Lyon County, Nevada (Figure 1). The Tailings Areas and Evaporation Ponds, and associated features, consist of seven major geographically and/or physically distinct units that are generally distributed through the northern portion of the mine site, as shown in Figure 2. An inactive solution pipeline traverses most of the site. Based on field inspections, record drawings and reports, and site testimony by Mr. Joe Sawyer (SRK Consulting; pers. comm., 2002), the major mine units that are the subjects of this Work Plan include:

- Oxide or Vat Leach Tailings are located between the Phase IV-VLT and Phase III-4X Arimetco Heap Leach Pads, and extends to the western margin of the mine site.
- Sulfide Tailings consist of the depositional area for dewatered or liquid slurry products of the sulfide ore beneficiation process. It is the largest mine surface feature and more or less occupies the northeast corner of the mine site, except for a natural topographic feature at its southeastern extent (i.e., McLeod Hill).
- Solution Recycling Ponds are a group of contiguous ponds in the southern portion of the Sulfide Tailings generally used for clarifying clay-laden process water for re-use
- Unlined Evaporation Ponds that include at least six distinct pond areas used to evaporate process solutions. The largest is a triangular feature located in the northern portion of the mine site between the Sulfide Tailings and the Phase IV-VLT Heap. Five “Finger Evaporation Ponds” are located underneath and north of the Phase IV-VLT Heap.
- Lined Evaporation Ponds that include four lined ponds at the northernmost margin of the mine site. Three historical ponds identified in this Work Plan are the South, Middle, and North ponds. One of the lined ponds is active, and is identified as the Pumpback Evaporation Pond.
- Weed Heights Sewage Lagoon is a municipal feature located in the southwestern corner of the South Lined Evaporation Pond described above, and consists of four adjacent settling/passive treatment sewage ponds. Sewage from Weed Heights and the Arimetco plant site first reports to two septic tanks and then to the lagoons.
- Landfills and Abandoned Features include one or more solid waste landfills within the mine site and other abandoned features (e.g., is a crusher- or hopper- supporting structure on the north face of the VLT Tailings.
- Trans-mine Asbestos Pipe that is a generally intact, approximate 12-inch diameter pipe with bell-and-spigot fittings. It traverses the site from the northeast corner of the W-3 Waste Rock Area, along the paved Weed Heights access road, and through the Arimetco Plant Site to the southern end of the Sulfide Tailings Impoundment.

1.2 Hydrogeologic Setting

The principal source of water in the Yerington area of Mason Valley is the Walker River (Huxel, 1969).

The East and West Walker Rivers originate in the Sierra Nevada mountain range and merge south of the mine site, from whence the Walker River flows northward through the valley to Walker Gap. From Walker Gap, it turns eastward and then southeastward to Weber Reservoir and ultimately to its terminus at Walker Lake. The Walker River is the primary source of natural recharge to the alluvial groundwater flow system that underlies the mine site, given that recharge from precipitation is very low (the annual average precipitation rate is 5.46 inches per year).

The native ground beneath the features addressed in this Work Plan consists of unconsolidated alluvial deposits derived by erosion of the uplifted mountain block of the Singatse Range and alluvial materials deposited by the Walker River. These unconsolidated deposits, collectively called the valley-fill deposits by Huxel (1969), comprise four geologic units: younger alluvium (including the lacustrine deposits of Lake Lahontan), younger fan deposits, older alluvium and older fan deposits. Lake Lahontan lacustrine deposits appear to have been removed and reworked by the Walker River as it meandered back and forth across the valley (Huxel 1969). Huxel estimated that Pleistocene Lake Lahontan in Mason Valley persisted for a relatively short time and was less than 60 feet deep.

A detailed assessment of groundwater conditions at the Yerington Mine Site is the subject of a Groundwater Conditions Work Plan, a companion document to this Tailings and Evaporation Ponds Work Plan. The assessment of groundwater flow and quality beneath and down-gradient of the mine site, including the mine units addressed in this Work Plan, will be discussed in the companion Work Plan.

1.3 Previous Monitoring and Data Acquisition

The United States Environmental Protection Agency (U.S. EPA, 2000) analyzed one sample from each of the following mine units: Sulfide Tailings Area (sample T-10), an Unlined Evaporation Pond (sample T-7), a Finger Evaporation Pond (sample T-8), and a Lined Evaporation Pond (sample T-9). Whole-rock analyses were performed on these samples as part of an initial CERCLA evaluation of the site, and are provided in Appendix A. These results are also presented in Table 1, with general background soil values for the area (Shacklette and Boerngen; 1984).

Applied Hydrology Associates (AHA, 1983) performed leach tests on samples of materials from the largest Unlined Evaporation Pond, the northern Lined Evaporation Pond, and the Sulfide Tailings Area. Leaching of the tailings material produced sulfate and calcium-dominated solutions, with arsenic and manganese concentrations above laboratory detection limits. Leachate from evaporation pond samples was elevated for a number of chemical constituents, notably sulfate, copper, iron, and manganese. A portion of the AHA report, including test results, is included in Appendix A.

As part of the engineering design of Arimetco's Phase IV-VLT Heap Leach Pad (Arimetco, 1993), a sample of proposed leach material from the Oxide (VLT) Tailings and a sample from the Sulfide Tailings ("Arimetco Clay") were tested under the Nevada Division of Environmental Protection's (NDEP's) Meteoric Water Mobility Procedure (MWMP). In addition, the VLT sample was subjected to static testing (i.e., acid/base accounting). The results of these tests are included in Appendix A. The acid-base accounting (ABA) results indicate that this material is slightly acid consuming (net acid neutralization potential, 0 > NNP < 10).

Recently, in the course of implementing the Final Work Plan for Interim Response Action – Temporary Cover of Two Iron Bleed Tailings Areas, NDEP (2002) collected eight samples (3 samples each from 2 locations, and 1 duplicate sample each location) for MWMP testing. These results are also included in Appendix A. Table 2 presents the results of these tests. The effluent pH was generally the same as the lixiviant pH, suggesting that the material is not acid generating.

Material Geotechnical Properties

During engineering design of Arimetco's Phase IV-VLT Heap Leach Pad (Arimetco, 1993), samples of Oxide and Sulfide Tailings were tested for particle size distribution (Arimetco, 1993). Oxide Tailings were found to be "poorly graded sand with silt and gravel (SP-SM)". Sulfide Tailings were classified as a "Grey Lean Clay (CL)". Sulfide Tailings were also evaluated for compaction characteristics, Atterberg Limits (plasticity and liquidity), and remolded permeability. Sulfide Tailings appear to be very uniform, and have a saturated permeability on the order of approximately 2×10^{-7} cm/second. This low permeability resulted in its use throughout the mine site as a secondary liner material.

Arimetco (1993) analyzed two samples of Oxide Tailings for copper content as a function of particle size. The analytical results are very similar to those from the Phase IV-VLT engineering design sample, demonstrating the homogeneous character of the Oxide Tailings. These results are also included in Appendix B.

Physical Stability

Engineering documents prepared for the Phase IV-VLT Heap Leach (Arimetco, 1993) included an evaluation of slope stability and soil strength properties. This report recommended constructed slope angles and benches, and included an evaluation of the liner strength of the Sulfide Tailings. The individual tailings material types appear to be consistent with regard to particle size distribution and geotechnical properties.

Pond Liners

In this Work Plan, "unlined" ponds refers to ponds for which various historical descriptions either explicitly state that the ponds are not lined, or where no reference to liners has been found. "Lined" ponds consist of evaporation ponds described as having an asphalt, compacted clay or high-density polyethylene (HDPE) liner.

1.4 Data Quality Objectives

The Data Quality Objectives (DQOs) for field sampling and analytical activities described in this Work Plan include the collection of appropriate data to support the:

- Assessment of current ecological and human health risk from exposed Tailings Area and Evaporation Pond materials to possible down-wind and down-gradient receptors; and
- Development and evaluation of closure alternatives for the Tailings Areas, Evaporation Ponds, and associated mine units.

A four-step DQO process was utilized to develop the activities described in this Work Plan. The DQOs will ensure that data of sufficient quality and quantity are collected to meet the project objectives. The four steps include:

- Step 1. State the Problem;
- Step 2. Identify the Decision;
- Step 3. Identify the Inputs to the Decision; and
- Step 4. Define the Boundaries of the Study.

The problem statement (Step 1) is as follows: "Materials from Tailings Areas, Evaporation Ponds and related mine units may have the potential to create a risk to human health and the environment, and to potentially degrade groundwater beneath the Yerington Mine Site".

Step 2 of the DQO process (Identify the Decision) asks the key question that this Work Plan is attempting to address: "What monitoring, sampling and analytical activities for the Tailings Areas, Evaporation Ponds and related mine units will serve to evaluate the potential for ecological and human health risk, potential degradation of groundwater, and support closure of the Yerington Mine site?" The field monitoring and sample collection and analysis activities proposed in this Work Plan will be integrated with previous and ongoing investigations and analytical results to answer this question. The criteria necessary to determine if the proposed Work Plan activities will answer this question include:

- Will the collected data adequately document the potential source characteristics and potential migration pathways of solids and liquids associated with the Tailings Areas, Evaporation Ponds and related mine units;
- Will the collected data provide sufficient information to develop and evaluate closure alternatives for the Tailings Areas, Evaporation Ponds and related mine unit materials.

Step 3 of the DQO process (Identify the Inputs to the Decision) identifies the kind of information that is needed to address the question posed under Step 2. Relevant historical and anecdotal information includes reference to construction and operation of the various facilities, previous field monitoring and analytical results, migration pathways and down-gradient receptors. The information obtained from the proposed site investigation activities will provide an adequate basis to address the other criteria of the DQO Process.

Step 4 of the DQO process (Define the Boundaries of the Study) defines the spatial and temporal aspects of the field monitoring, sampling and analytical activities proposed in this Work Plan. The field and analytical activities described in this Work Plan will be conducted in 2002 and 2003 on the mine units identified in Section 1.1 and depicted in Figure 2.

The DQO steps described above will be consistent with the Conceptual Site Model (CSM), currently under review by the Yerington Technical Work Group (YTWG). The flow diagram for the CSM is reproduced as Figure 3 of this Work Plan. The Tailings Areas, Evaporation Ponds and related mine units are identified as potential sources within the "surface mine units and process areas" category in Figure 3.

SECTION 2.0

BACKGROUND INFORMATION

This section describes the Tailings Areas, Evaporation Ponds and related mine units organized under the following headings:

- Construction and Operation
- Land Status
- Physical Description

Section 2.9 and Appendix C provide an historical review of the development of the tailings and pond areas. Appendix D presents recent photographs of these areas.

2.1 Oxide Tailings (VLT) Area

Construction and Operation

The Oxide Tailings or Vat Leach Tailings (VLT) are the leached products of Anaconda's Vat Leach copper extraction process. In this Work Plan, the materials are referred to as VLT and the area where they were deposited is referred to as the Oxide Tailings Area. Anaconda began to deposit these tailings at a rate of about ten thousand tons per day in 1953. The Vat Leach process involved serial crushing of graded, pit-mined oxide copper ore to a uniform, minus 0.5-inch size. The crushed ore was loaded into one of a row of eight large concrete leach vats where a weak sulfuric acid solution was circulated through it over a period of about eight days. Pregnant leach solution leaving the vats was passed on to the copper precipitation vats located nearby, where cement copper was precipitated onto scrap iron and de-tinned cans. The barren solution then passed to iron launders where excess iron was removed, and the solution was then reused in the Leach Vats (Dalton, 1998).

After the eight-day Vat Leach process, the crushed ore was removed from the Vats by a "clamshell" (a cable-operated excavator used in confined space operations) and loaded to a belt conveyor running along the row of Vats. This conveyor delivered the crushed to haul trucks for conveyance to the Oxide Tailings Area. The sulfate- and iron-rich acidic solution that resulted from this process was delivered after treatment to remove acidity to the Unlined and Lined Evaporation Ponds northwest of the Sulfide Tailings Area (Dalton, 1998).

Over a period of 25 years, the Oxide Tailings Area expanded to encompass nearly 500 acres at an average height of over 100 feet. Because of its consistent material characteristics, similar to an aggregate base, VLT has been used in asphalt, concrete, and as engineered fill. In planning for the Phase IV-VLT Heap Leach project, Arimetco (1993) estimated that 70 million tons remained in the Oxide Tailings Area.

Land Status

The Oxide Tailings Area is located almost entirely on private land (Figure 2). A portion of the southwest corner is located on land controlled by the BLM. The historic Weed Heights Landfill, which was operated by Don Tibbals and others, is contiguous with, covered by, and may be built on VLT deposited early in the operational history of the site. The Landfill's area extent is accounted separately from the Oxide Tailings Area in this Work Plan.

Physical Description

The Oxide Tailings Area covers approximately 500 acres. Its surface is composed of multiple benches and "end-dump" mounds of VLT (see Appendix D, Photo 1). It has a maximum elevation of approximately 4,622 feet above mean sea level (amsl) near its center, and a minimum elevation of approximately 4,440 feet amsl at its northern end. Slopes up to 80 feet high exist on the north, west, and southeast of the VLT. These slopes area generally sloped, without benches, at or near the angle of repose (see Appendix D, Photo 2). Access to the surface of the tailings is via roads from the Phase IV-VLT Heap Leach Pad, and via entrance ramps on the north and south ends (Figure 4). Stormwater may either pond on the surface, or run off to an adjacent slope.

The material is a very evenly crushed quartz monzonite and, based on observations, appears to be well oxidized and homogeneous. Particle size ranges from approximately 0.5-inch to fine sand size. Field observations and review of topographic maps suggest that the slopes are stable.

2.2 Sulfide Tailings Area

Construction and Operation

Sulfide Tailings resulted from the sulfide ore beneficiation process that operated between 1965 and 1978. The sulfide ore process circuit involved fine crushing and copper sulfide recovery by chemical flotation, in which lime was added to maintain a basic pH solution. The tailings were then deposited as a slurry in designated pond areas, from which the decanted solution was pumped back to the process circuit at a rate of approximately 6,000 gallons per minute (gpm). (Dalton, 1998)

Seepage from the northernmost tailings area was collected in a peripheral ditch and recycled along with the pond fluid. The tailings ponds dried soon after milling ceased in June 1978, whereas the acid brine in the Unlined Evaporation Ponds took significantly longer to dry (Applied Hydrology Associates, 1983).

Land Status

The Sulfide Tailings are approximately evenly distributed between public land controlled by the BLM and private land. A Class III Landfill operated by Arimetco (see Section 2.6) is located within BLM land. The majority of clay borrow material used to construct Heap Leach Pad liners was excavated from the area of private land (Figure 2).

Physical Description

The sulfide tailings impoundment consists of a dam built of VLT materials on the north and east (downslope) faces. The dam (see Appendix D, Photo 3) rises from a base elevation of approximately 4,360 feet amsl on the east face to 4,400 feet amsl at its crest. The dam slopes to the northeast, consistent with underlying topography. Volunteer vegetation has locally developed on the Sulfide

Tailings (see Appendix D, Photo 4).

2.3 Process Solution Recycling Ponds

Construction and Operation

A number of pond cells exist on the southern margin of the Sulfide Tailings Area. Dalton (1998) describes Anaconda's sulfide or processing circuit as including a solution recovery process via clarification ponds, but does not specify pond locations or provide additional descriptions. Homogeneous clay materials such as that found in the Sulfide Tailings may be expected to require a long holding period and multiple ponds. Given the large number and geometry of the ponds south of the Sulfide Tailings Area, Dalton's description fits their use in process solution clarification.

Land Status

The Process Water Recycling Ponds are located on both public land controlled by the BLM and private land.

Physical Description

The material in these ponds (see Appendix D, Photo 5) appear to be homogeneous reddish to grayish clay. Some of the ponds have been covered with VLT material. With little exception, the material appears to be identical to the Sulfide Tailings clay.

2.4 Unlined Evaporation Ponds

Construction and Operation

At least six distinct Unlined Evaporation Ponds are located within the Yerington Mine Site. The largest, a triangular facility located at the northwest corner of the Sulfide Tailings area, was used between 1953 and 1978 to manage solutions from the oxide and sulfide processing circuits (Dalton, 1998). Solution from the oxide process was delivered via an unlined ditch to the ponds at an estimated rate of up to 700 gpm.

The "Finger Evaporation Ponds" are less well understood. They appear to have been constructed and partially filled in prior to Arimetco's start of operations in 1989. Arimetco built the first portions of the Phase IV-VLT Heap over the southern portions of these ponds (Arimetco, 1993). Three of the ponds (segments A, B, and D shown in Figure 6) have been filled in, apparently with native alluvial material. An excavation by Arimetco, in one of these areas when contemplating the expansion of the Phase IV-VLT Heap, resulted in exposing red dust. The excavation remained open until NDEP capped the entire area with VLT materials in 2000 and 2001.

<u>Land Status</u>

The largest Unlined Evaporation Pond is approximately evenly distributed between public land controlled by the BLM and private land. The "Finger Evaporation Ponds" are located entirely within private land.

<u>Physical Description</u>

Each of the Unlined Evaporation Ponds (See Appendix D, Photo 6) consists of a shallow, or no, excavation at its south end, and a berm of alluvium or mixed alluvium and VLT materials at its north, downslope end. The basal portions of the largest Unlined Pond and Finger Ponds C and E are exposed.

2.5 Lined Evaporation Ponds

<u>Construction and Operation</u>

The North, Middle, and South Lined Evaporation Ponds were placed into operation between 1960 and 1978 following the use of the largest Unlined Evaporation Pond (see Appendix C and Dalton, 1998). These three ponds were constructed to the northern margin of the mine site. Their use was probably similar to that for the Unlined Evaporation Ponds (see Section 2.3).

Subsequently, Atlantic Richfield constructed and improved three lined Pumpback Evaporation Ponds to manage groundwater pumped along the northern margin of the mine site. These ponds passively evaporate groundwater pumped by eleven wells to limit the off-site migration of constituents of concern.

Land Status

The Lined Evaporation Ponds are located almost entirely within land controlled by the BLM. A portion along the western margin of the North, Middle, and South Lined Evaporation Ponds is located within private land.

Physical Description

Each of the North, Middle, and South Lined Evaporation Ponds (See Appendix D, Photo 7) consists of a shallow, or no, excavation at its south end, and a berm of alluvium at its north, downslope end. The ponds are reported to be asphalt and possibly clay-lined (pers. comm.; Joe Sawyer, SRK; 2002). Surface sediments appear similar to sediments observed in the largest Unlined Evaporation Pond.

The Pumpback Evaporation Ponds (See Appendix D, Photo 7) contain a managed quantity of groundwater during most of the year. The ponds were lined with compacted clay material (permeability on the order of 10^{-5} to 10^{-7} cm/s). Liners were refurbished with single 60-mil HDPE liners added to the middle and south cells between 1999 and 2001 (AHA, 2002).

2.6 Weed Heights Sewage Lagoon

Construction and Operation

As shown in Figure 4, Arimetco constructed a sewage treatment system consisting of:

- Two septic tanks near the Anaconda Plant Site;
- Sewage effluent pipelines from Weed Heights and the Arimetco Plant Site to the septic tanks; and
- Sewage effluent pipelines from the tanks to sewage lagoons in the northern portion of the mine site.

The lagoons were originally located within the "Finger Evaporation Ponds" at one time, but during construction of the Phase IV-VLT Heap Leach they were relocated to the southwest corner of the South Lined Evaporation Pond (see Appendix E, Photo 8), their current location.

Land Status

The majority of the sewage system is located on private land. However, however a portion of the Sewage Lagoons appears to be located on land controlled by the BLM (Figure 6).

Physical Description

The Sewage Lagoons appear to be lined facilities (although information regarding the liner type could not be found) with containment berms constructed of alluvial materials.

2.7 Arimetco Landfills and Abandoned Mine Units

Construction and Operation

Arimetco mine units located outside of the Arimetco Plant Site Area (the subject of a companion Work Plan), include a Class III Landfill within the Sulfide Tailings Area and a bin support structure located at the north end of the Oxide Tailings Area. Other miscellaneous pipelines and materials not included in other Work Plans are incorporated into this Work Plan.

Land Status

Abandoned Arimetco features lie within both private and public lands. The Arimetco Class III Landfill is located within land controlled by the BLM.

Physical Description

The landfill, shown in Figure 5, is partially buried with VLT.

2.8 "Transite" Pipeline

Construction and Operation

A bell-and-spigot "transite" pipeline constructed of concrete and asbestos that was used to convey acidic solutions and sulfide tailings slurry exists at various locations at the mine site. It was noted during preliminary reconnaissance on the ground surface along the eastern and northern edges of the W-3 Waste Rock Dump south of the Weed Heights access road to the Arimetco Plant Site, and from the Plant Site to the Sulfide Tailings.

Land Status

The pipeline traverses both private and public lands.

Physical Description

The pipeline consists of 12-inch bell-and-spigot 15-foot long segments. It is anchored by rebar and rope, cable, and other ties at many of the bell-and-spigot connections, and portions of the pipe have been repaired by rubber and steel pressure couplings.

2.9 Historic Tailings Area and Evaporation Pond Development

The temporal and spatial distribution of the Tailings Areas, Evaporation Ponds and related mine units discussed in Sections 2.1 through 2.5 are based on a review and analysis of historical maps and aerial photographs. These visual records are reproduced for the mine site, with the modern boundaries of each major facility shown and identified, in Appendix C.

1954 Aerial Photo (C1)

North of Weed Heights and the Anaconda Plant Site, developing portions of the Oxide and Sulfide Tailings Areas and largest Unlined Evaporation Pond can be seen in this photo. Oxide Tailings were deposited in linear piles generally parallel to topography and covered approximately 115 acres in 1954. Process solutions appear to have been placed over the natural ground surface to where it was contained by a berm/road feature (corresponding to the northern margin area of the current Unlined Evaporation Pond). The area of deposited process solutions covers approximately 260 acres in this photo.

1957 USGS Wabuska, NV Topographic Map (C2)

The Oxide Tailings Area is generally similar in size to the area shown in the 1954 photo. A large "Tailings Pond" covers the majority of the tailings depositional area shown in the 1954 photo with distinctive western, southern and eastern boundaries (shown as roads on this map). This suggests that process solutions were managed in a more laterally contained area.

1977 Aerial Photo (C3)

The 1977 aerial photo mosaic provides a color illustration of the mine prior to close of operations. All features discussed in this Work Plan are clearly shown. The Finger Evaporation Ponds and the Process Solution Recycling Ponds extend north and northeast of the Oxide Tailings, respectively. The Unlined Evaporation Pond in this photo covers a portion of the tailings depositional area seen in the 1954 photo, and is located northeast of the largest Finger Evaporation Pond. The Sulfide Tailings Area is located northeast of the Process Solution Recycling Ponds. The Lined Evaporation Ponds are located north of the Unlined Evaporation Pond, and north of the original berm that contained Sulfide Tailings in 1954.

Solution containment ditches can be seen in this photo, and are located immediately north of the Unlined Evaporation Pond and along the northern portion of the Sulfide Tailings Area. Approximate areas of these features are: Oxide Tailings – 350 acres (a portion of which is now covered by the Arimetco Phase IV-VLT Heap Leach Pad); Finger Ponds – 125 acres (a portion of which is now covered by the Arimetco Phase IV Heap Leach Pad); Recycling Ponds – 287 acres; Unlined Evaporation Pond – 116 acres; Lined Evaporation Ponds – 92 acres; and Sulfide Tailings – 385 acres.

1980 Infrared Aerial Photo (C4)

This photo mosaic shows drying tailings and ponds areas with localized occurrences of standing water in the Unlined Evaporation Pond and in the North, Middle, and South Lined Evaporation Ponds. Depositional paths of Sulfide Tailings and evidence of erosion of a small portion of the northeast margin of the Oxide Tailings can also be seen.

1987 USGS Mason Butte, NV Topographic Map (C5)

This map indicates similar features to those visible in the 1977 and 1980 aerial photos. The large Finger Pond "E" is mapped as "Tailings" and is shown in two sections (this partition is not distinguishable today). The southern portion of the Wabuska Drain is also seen on this map.

2001 Color Air Photo (C6)

The effects of Arimetco's operations in this portion of the mine site are visible: removal of a portion of the Oxide Tailings and construction of the Phase IV-VLT Heap Leach Pad and associated ponds. The Weed Heights Sewage Lagoons are also shown. The Pumpback Evaporation Ponds are located north of the Unlined Evaporation Pond and east of the Lined Evaporation Ponds. Current areas developed from an orthographically corrected version of this aerial photograph series are: Oxide Tailings – 344 acres; Finger Ponds – 46 acres; Recycling Ponds – 287 acres; Unlined Evaporation Pond – 116 acres; Lined Evaporation Ponds – 92 acres; Pumpback Evaporation Ponds – 24 acres; and Sulfide Tailings – 385 acres.

2.10 Summary of Current Conditions

After filing for bankruptcy in 1997, Arimetco abandoned its operations at the Yerington Mine in January 2000. Current site care and maintenance involves heap solution management, operation of the pumpback well and evaporation system, general site clean-up and site security.

Atlantic Richfield currently operates three Lined Pumpback Evaporation Ponds near the northern end of the property to manage groundwater produced by the pumpback well system. The Weed Heights Sewage Lagoons and septic system are currently functional, and serve the Weed Heights community. The Weed Heights landfill may still be operated intermittently.

SECTION 3.0

WORK PLAN

Atlantic Richfield proposes to conduct site investigations of the Tailings Areas, Evaporation Ponds and associated mine units in a manner consistent with the DQOs described in Section 1.4. Based on the information presented in Sections 1.3 and 2.0, the origin, spatial distribution and geochemical characteristics of solid materials in the Oxide and Sulfide Tailings Areas, and the sediments in the Evaporation Ponds is reasonably well known. Past operations that included solids or slurry materials deposition, and associated solution management, appear to have been fairly consistent. The degree of homogeneity in the Oxide and Sulfide Tailings, and pond sediments, indicates that limited sampling will be required to characterize these solid materials. This Work Plan provides for the evaluation of the following general characteristics of each mine surface feature, and its associated components, as appropriate:

- Mine Unit Inventory and Description
- Material Volume
- Material Geochemical Analyses
- Material Geotechnical Analyses

Prior to the start of work, field personnel will conduct a health and safety meeting to review the Site Health and Safety Plan and to verify personal training certification. Copies of training certificates and attendance logs from the meeting will be obtained. All work will be conducted in accordance with the Site Health and Safety Plan, and with the JSA provided in Section 3.4.

3.1 Mine Unit Investigations

Field Reconnaissance and Catalogue

As stated previously, the Oxide and Sulfide Tailings Areas and Evaporation Ponds are fairly well documented and understood. However, the associated mine units that exist outside of the Arimetco

Plant Site and Mill Process Areas, subjects of companion Work Plans, are not completely delineated. Additional information for the Weed Heights Sewage Lagoon, Arimetco Landfills and Abandoned Features, and the Transite Pipe will be enhanced using the following steps:

- Field notes will be taken directly on an appropriately scaled base map and/or aerial photograph.
- Where appropriate, paced distance and/or hand-tape measurements of specific features will be recorded in a bound field notebook
- Partial or complete exposure of landfill waste will be photographed and noted on the map. In the area of the Weed Heights Landfill, evidence of recent earthwork (bulldozer tracks, sunken fills, etc.) will be used to delineate the boundaries of solid waste. Telephone or in-person interviews and field evidence will be used to understand the present status of the Landfill.
- The entire length of the Transite Pipeline will be mapped using a hand-held GPS unit. Features such as culverts, road crossings, breaks and extra pipe sections will be noted on the base map and, if appropriate, documented by photographs.
- Tailings Areas, Evaporation Ponds and the Weed Heights Sewage Lagoons will be more closely inspected and photographed, with particular attention being given to pipe inlets or outlets, and liner or berm conditions.

Material Volumes

The quantity of material contained in the Oxide and Sulfide Tailings will be calculated by interpolating adjacent grades to estimate original ground topography, and comparing this surface with a Digital Terrain Model (DTM) based on topography generated by August 2001 photogrammetric methods. Material volumes in each of the Evaporation Ponds will be estimated based on sediment thickness and type observed in one or more test pits, and the base aerial extent of the facility.

Material Geochemical and Geotechnical Characteristics

Given the homogeneity observed for the solid materials contained within the Tailings Areas and Evaporation Ponds, the proposed sampling locations shown in Figures 4, 5, and 6 should be sufficient for a complete geochemical and geotechnical characterization of these mine units. A summary of proposed samples is presented below:

Oxide Tailings Area (Figure 4)

- Two samples will be collected and composited from 0 to 12 inches below the surface from 3 sub-samples at each sample location (see below).
- Each composited sample will be analyzed for acid-base-accounting (ABA), whole-rock analysis, agricultural parameters and grain size (see below).

Sulfide Tailings Area (Figure 5)

- Two samples will be collected and composited from 0 to 12 inches below the surface from 3 sub-samples at each sample location (see below).
- Each composited sample will be analyzed for acid-base-accounting (ABA), whole-rock analysis, agricultural parameters and grain size (see below).

Recycling Ponds (Figure 5)

- Two samples will be collected and composited from 0 to 12 inches below the surface from 3 sub-samples at each sample location (see below).
- Each composited sample will be analyzed for acid-base-accounting (ABA), whole-rock analysis, agricultural parameters and grain size (see below).

Finger Evaporation Ponds (Figure 6)

- Five samples will be collected and composited from 0 to 12 inches below the surface from 3 sub-samples at each sample location (see below).
- Each composited sample will be analyzed for acid-base-accounting (ABA), whole-rock analysis, agricultural parameters and grain size (see below).

Unlined Evaporation Ponds (Figure 6)

- Four samples will be collected and composited from 0 to 12 inches below the surface from 3 sub-samples at each sample location (see below).
- Each composited sample will be analyzed for acid-base-accounting (ABA), whole-rock analysis, agricultural parameters and grain size (see below).

Pumpback Evaporation Pond (Figure 6)

- Three samples (one each from the South, Middle and North Ponds) will be collected and composited from 0 to 12 inches below the surface from 3 sub-samples at each sample location (see below).
- Each composited sample will be analyzed for acid-base-accounting (ABA), whole-rock analysis, agricultural parameters and grain size (see below).

At each sample location, a visual description (accompanied by a photograph) will be made of the sample excavation. Particular attention will be paid to cover and construction material types for the Ponds and Sulfide Tailings (e.g. alluvium or Oxide Tailings).

Solid materials will be sampled by excavating, with hand tools (e.g., disposable plastic trowels or shovels) from a single sample location approximately 2.5 gallons of each material at that location (e.g. two distinct "colors" of sediment may be present in some or all of the evaporation ponds). These sub-samples from each location will the shaken in a 5-gallon bucket to produce a composite sample and eliminate strata variation effects. The following splits from each composite sample will be obtained by hand-sorting to eliminate oversized material:

- 2 Kg of material for whole-rock analysis, placed in a clean re-sealable baggy.
- 1 Kg each material for agricultural and ABA analyses placed in clean re-sealable baggies.
- 1 Kg each of material for grain size analysis placed in clean re-sealable baggies.

If hand-tool excavation (to a maximum depth of approximately three feet) does not identify the lower boundary of sediments at a sample location, or (in the case of Finger Evaporation Ponds A, B, and D) the sediment material is buried too deeply for hand tool sampling, a backhoe may be used to allow deeper excavation.

Each sample will be sealed and labeled with QA/QC procedures described below prior to shipment to the analytical laboratory.

Duplicate samples will be collected at a frequency of one in eight-to-ten samples. Duplicate samples will be collected by filling the containers for each analysis at the same time the original sample is collected. Each sample from a duplicate set will have a unique sample number labeled in accordance with the identification protocol, and the duplicates will be sent "blind" to the lab. For quality assurance purpose, no special labeling indication of the duplicate will be provided.

The potential for materials, particularly Sulfide Tailings and pond sediments, to generate fugitive dust, and the capacity of all materials to retain moisture will be evaluated. Samples will be collected for laboratory analysis of grain size distribution (ASTM D-422 testing method). The grain size distribution data will be used to estimate hydraulic characteristics of the materials. This information may be used to evaluate the moisture storage capacity as a component of surface hydrology analysis, and in characterization of the materials for use as growth media.

3.2 Quality Assurance and Quality Control

Procedures for data collection and analysis will follow the specifications and standard operating procedures (SOPs) described in this section. These procedures will adhere to quality assurance and quality control (QA/QC) methods to ensure that the quality and quantity of the analytical data obtained during the field activities are sufficient to support the DQOs. QA/QC issues include:

- Detection limit and laboratory analytical level requirements;
- Selection of appropriate levels of precision, accuracy, representiveness, completeness, and comparability for the data and any specific sample handling issues; and
- Identification of confidence levels for the collected data.

Solid Materials Analysis

Samples specified for whole-rock analysis and ABA will be evaluated by a Nevada-certified laboratory for the geochemistry of the digested rock and soil material. The parameter list for whole-rock analyses, detection limits and analytical methods are listed in Table 4. Samples for the evaluation of agricultural properties will be analyzed for Nitrogen, Phosphorus and Potassium (NPK) concentrations; Boron, Chlorine, Calcium, Magnesium and Sodium concentrations; and the calculation of the Sodium Absorption Ratio (SAR).

Sample Identification and Preservation

Sample labels will be completed and attached to each laboratory sample container after each sample is collected. Strict attention will be given to ensure that each sample label corresponds to the collection sequence number marked on the bottle prior to sample collection. The labels will be filled out with a permanent marker and will include the following information:

- Sample identification
- Sample date
- Sample time
- Analyses to be performed
- Person who collected sample

Each sample will be tracked according to a unique sample field identification number assigned when the sample will be collected. This field identification number consisted of two parts:

- Sampling location
- Collection sequence number

For example, the sample collected on the Oxide Tailings at the second location sampled will be labeled: TO002. Duplicate samples will be labeled in the same fashion, with no indication of their contents. For example, the duplicate sample to the one stated above might be labeled: TO003.

Sample Handling and Transport

The QA objectives for the sample-handling portion of the field activities are to verify that packaging and shipping are not introducing variables into the sampling chain that could provide any basis to question the validity of the analytical results. In order to fulfill these QA objectives, duplicate QC samples will be used as described below. If the analysis of any QC samples indicates that variables are being introduced into the sampling chain, then the samples shipped with the questionable QC sample will be evaluated for the possibility of contamination.

3.3 Site Job Safety Analysis

A site-specific Job Safety Analysis (JSA) for this Work Plan is attached as Appendix C, in accordance with Atlantic Richfield Health and Safety protocol and the Brown and Caldwell Yerington Mine Site Health and Safety Plan (SHSP). The SHSP identifies, evaluates, and prescribes control measures for safety and health hazards, in addition to providing for emergency response at the Yerington Mine site. SHSP implementation and compliance will be the responsibility of Brown and Caldwell, with Atlantic Richfield taking an oversight and compliance assurance role. Any changes or updates will be the responsibility of Brian Bass with Brown and Caldwell, with review by Atlantic Richfield Safety Representative Lorri Birkenbuel. Three copies of this plan will be maintained. One copy will be located at the site, one copy will be located in Atlantic Richfield's Anaconda office, and one copy will be located in the Brown and Caldwell office.

The SHSP includes:

- Safety and health risk or hazard analysis;
- Employee training records;
- Personal protective equipment (PPE);
- Medical surveillance;
- Site control measures (including dust control);
- Decontamination procedures;
- Emergency response; and
- Spill containment program.

The SHSP includes a section for site characterization and analysis that will identify specific site hazards and aid in determining appropriate control procedures. Required information for site characterization and analysis includes:

- Description of the response activity or job tasks to be performed;
- Duration of the planned employee activity;
- Site accessibility by air and roads;
- Site-specific safety and health hazards;
- Hazardous substance dispersion pathways; and
- Emergency response capabilities.

All contractors will receive applicable training, as outlined in 29CFR 1910.120(e) and as stated in the SHSP. Copies of Training Certificates for all site personnel will be attached to the SHSP. Personnel will initially review the JSA forms at a pre-entry briefing. Site-specific training will be covered at the briefing, with an initial site tour and review of site conditions and hazards. Records of pre-entry briefings will be attached to the SHSP.

Elements to be covered in site-specific briefing include: persons responsible for site-safety, site-specific safety and health hazards, use of PPE, work practices, engineering controls, major tasks, decontamination procedures and emergency response. Other required training, depending on the particular activity or level or involvement, may include MSHA 40-hour training and annual 8-hour refresher courses. Other training may include, but is not limited to, competent personnel training for excavations and confined space, first aid, and cardio-pulmonary resuscitation (CPR). Copies of the 40-hour and annual refresher certificates, for site personnel, will be attached to the SHSP.

The individual JSA for the Tailings and Evaporation Ponds work incorporates individual tasks, the potential hazards or concerns associated with each task, and the proper clothing, equipment, and work approach for each task. The following table outlines the tasks and associated potential hazards that are included in the Tailings and Evaporation Ponds JSA:

SEQUENCE OF BASIC JOB STEPS	POTENTIAL HAZARDS
1. Collect solid materials samples	• Skin irritation from dermal or eye contact • Steep slopes, hard, sharp, irregular surfaces on all WRD's
2. All Activities	• Slips, Trips, and Falls
3. All Activities	• Back, hand, or foot injuries during manual handling of materials.
4. All Activities	• Heat exhaustion or stroke.
All Activities	• Hypothermia or frostbite
Unsafe conditions.	• All potential hazards.

A copy of the Tailings Impoundment JSA is provided in Appendix F.

SECTION 4.0

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